

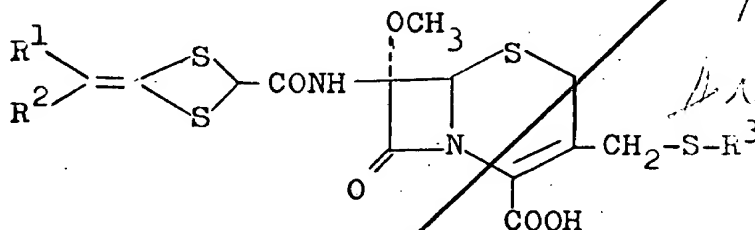
c2  
60  
filtered and dried under reduced pressure to provide 120 mg.  
of <sup>a</sup> powder of 7 $\beta$ -(4-cyano-3-methoxyisothiazol-5-yl)thio-  
acetamido-7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl-  
 $\Delta^3$ -cephem-4-carboxylic acid.

P  
Nuclear magnetic resonance spectra (D<sub>6</sub>-DMSO)

{  
(p.p.m.): 3.40 (3H), 3.58 (2H), 3.92 (3H), 3.99 (3H),  
4.15 (2H), 4.18 (2H), 5.12 (1H).

my  
What is claimed is:

1. ~~7 $\alpha$~~ -Methoxy-7 $\beta$ -(4-substituted methylene-1,3-dithietan-2-yl)carboxamido-3-heterocyclic thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula



wherein R<sup>1</sup> represents a carboxyl group or the functional derivative residue thereof; R<sup>2</sup> represents a hydrogen atom, a lower alkyl group, a lower alkoxy group, R<sup>4</sup>S(O)<sub>n</sub> group (wherein R<sup>4</sup> represents a lower alkyl group and n represents 0, 1 or 2), a lower alkanoyl group, an aryl group, an aroyl group, a carboxyl group or the functional derivative residue thereof, a lower alkenyl group, a sulfamoyl group, or a heterocyclic residue; and R<sup>3</sup> represents a lower alkyl-substituted tetrazolyl group or a lower alkyl-substituted thiadiazolyl group

and the pharmaceutically acceptable salts thereof.

2. 7 $\beta$ -{4-[(Carbamoyl)(carboxy)methylene]-1,3-dithietan-2-yl}carboxamido-7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid as claimed in claim 1.

3. 7 $\beta$ -[4-(1-Carboxyethylidene)-1,3-dithietan-2-yl]carboxamido-7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid as claimed in claim 1.

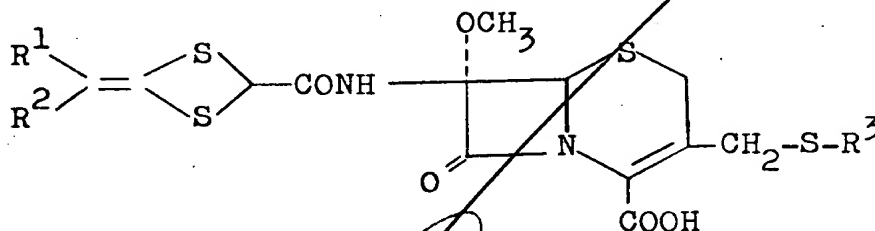
4. 7 $\beta$ -{4-[(Carboxy)(methoxy)methylene]-1,3-dithietan-2-yl}carboxamido-7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid as claimed in claim 1.

5.  $7\beta$ -{4-[(Carboxy)(methylthio)methylene]-1,3-dithietan-2-yl}carboxamido-7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid as claimed in claim 1.

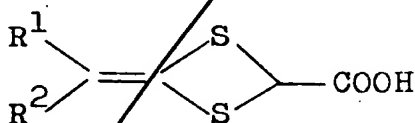
6.  $7\beta$ -{4-[(Carboxy)(ethylthio)methylene]-1,3-dithietan-2-yl}carboxamido-7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid as claimed in claim 1.

7.  $7\beta$ -[4-(Carboxymethylene)-1,3-dithietan-2-yl]carboxamido-7-methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid as claimed in claim 1.

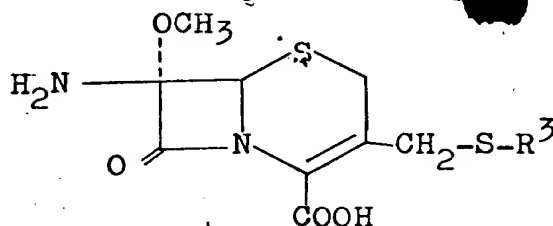
8. A process for the preparation of 7 $\alpha$ -methoxy-7 $\beta$ -(4-substituted methylene-1,3-dithietan-2-yl)carboxamido-3-heterocyclic thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula



wherein  $R^1$ ,  $R^2$  and  $R^3$  have the same significance as in claim 1, which comprises reacting the 4-substituted methylene-1,3-dithietan-2-carboxylic acid represented by the general formula

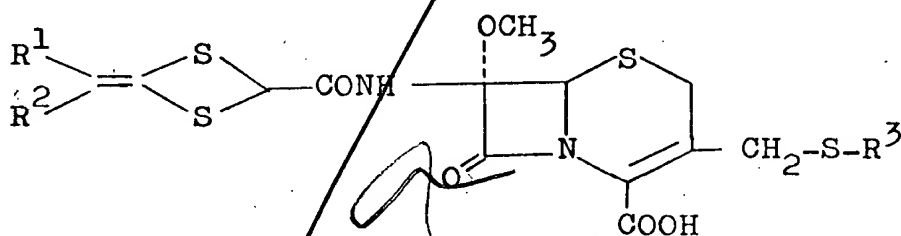


wherein  $R^1$  and  $R^2$  have the same significance as above, or the functional derivative thereof, with the 7 $\beta$ -amino-7 $\alpha$ -methoxy-3-heterocyclic thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula

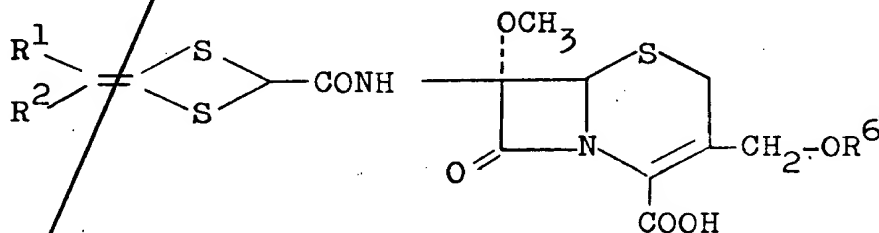


wherein  $R^3$  has the same significance as above.

9. A process for the preparation of  $\alpha$ -methoxy- $7\beta$ -(4-substituted methylene-1,3-dithietan-2-yl)carboxamido-3-heterocyclic thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula



wherein  $R^1$ ,  $R^2$  and  $R^3$  have the same significance as in claim 1, which comprises reacting the 3-acetoxymethyl- (or 3-carbamoyloxymethyl-)  $\alpha$ -methoxy- $7\beta$ -(4-substituted methylene-1,3-dithietan-2-yl)carboxamido- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula

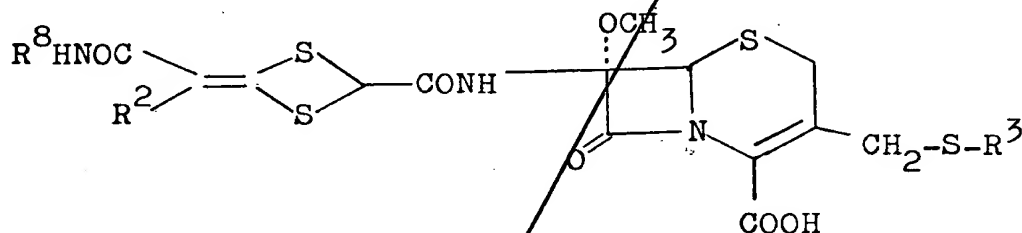


wherein  $R^1$  and  $R^2$  have the same significance as above and  $R^6$  represents an acetyl group or a carbamoyl group, with the heterocyclic thiol represented by the general formula



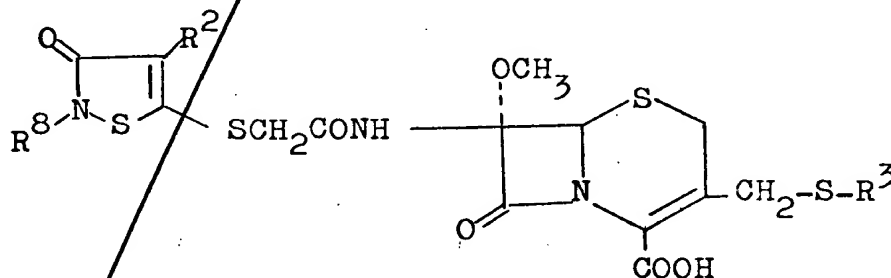
wherein  $R^3$  has the same significance as above.

10. A process for the preparation of 7 $\alpha$ -methoxy-7 $\beta$ -(4-substituted methylene-1,3-dithietan-2-yl)carboxamido-3-heterocyclic thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula



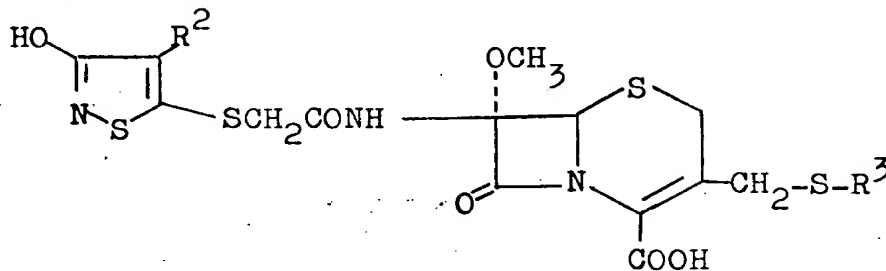
wherein R<sup>2</sup> and R<sup>3</sup> have the same significance as in claim 1 and R<sup>8</sup> represents a hydrogen atom or a substituted or unsubstituted alkyl group,

which comprises treating <sup>under a basic condition</sup> the 7 $\alpha$ -methoxy-3-heterocyclic thiomethylcephalosporin derivative represented by the general formula



wherein R<sup>2</sup>, R<sup>3</sup> and R<sup>8</sup> have the same significance as above.

11. 7 $\beta$ -(3-Hydroxy-4-substituted isothiazol-5-yl)thioacetamido-7 $\alpha$ -methoxy-3-heterocyclic thiomethyl- $\Delta^3$ -cephem-4-carboxylic acid represented by the general formula



wherein R<sup>2</sup> and R<sup>3</sup> have the same significance as in claim 1, and the pharmaceutically acceptable non-toxic salts thereof.

9 ~~12~~ 7 $\beta$ -(4-Carboxy-3-hydroxyisothiazol-5-yl)thioacetamido-  
7 $\alpha$ -methoxy-3-(1-methyltetrazol-5-yl)thiomethyl- $\Delta^3$ -cephem-  
4-carboxylic acid as claim ~~11~~ <sup>8</sup> 60

End -

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